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Enhancing Smile Aesthetics with Thermocatalytic Intracoronal Bleaching Technique

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Abstract : *Discoloration of a non-vital anterior teeth is a frequent aesthetic concern, particularly in young adults with a history of trauma or pulpal necrosis. Traditional restorative options like crowns and veneers, though effective, involve invasive preparation of the tooth. This case report highlights the conservative management of a discolored, root canal–treated maxillary central incisor using the thermocatalytic intracoronal bleaching technique. A 22-year-old patient was treated with a mixture of sodium perborate and 6% hydrogen peroxide placed in the pulp chamber, followed by LED light activation during a subsequent visit to enhance the bleaching effect. Composite restoration was completed in the third appointment. At one-week follow-up, the tooth exhibited stable shade with no adverse effects such as sensitivity, secondary discoloration, or cervical resorption. This technique proved to be a minimally invasive, cost-effective, and aesthetically reliable solution for managing intrinsic discoloration in non-vital teeth.*

IndexTerms **- Intracoronal bleaching, Non-vital tooth, Thermocatalytic bleaching, Aesthetic dentistry, LED activation.**

INTRODUCTION

Intrinsic discoloration of non-vital teeth arises from degradation products of hemoglobin, necrotic pulp remnants, and residual obturating materials that percolate dentinal tubules[1]. Such discolorations are particularly conspicuous in the aesthetic zone and can diminish a patient's confidence[2]. Although indirect restorations reliably mask discoloration, the irreversible removal of enamel and dentin contradicts modern conservative principles[3]. Since Nutting and Poe popularized the walking bleach technique in 1967,[4] intracoronal bleaching has become the treatment of choice for non-vital discoloration when the root canal obturation is sound and the periodontal tissues are healthy[5]. Sodium perborate mixed with hydrogen peroxide produces a stable perhydroxyl ion-rich paste that diffuses through dentin, oxidizing chromogenic molecules into smaller, colorless compounds[6]. The present case illustrates how a judiciously executed walking bleach protocol, enhanced by LED light activation, can restore harmony to the smile of a young adult within a short timeframe and with negligible biological risk[7].

CASE REPORT

A 22-year-old female patient referred to the Department of Career Post graduate Institute of Dental Sciences and Hospital, with a chief complaint of a "discolored upper front tooth" that had gradually deepened in color over the previous twelve months. She reported an uncomplicated traumatic incident to the anterior maxillary region a year earlier that necessitated root canal therapy on tooth 21. The medical history was non-contributory, and the patient neither smoked nor consumed staining beverages in excess. Clinical inspection revealed a uniform brownish-gray discoloration of tooth 21 while adjacent teeth retained a Vita shade of A2. The tooth was asymptomatic, with no tender on percussion and palpation, and exhibited physiologic mobility. Radiographically, a well-condensed gutta-percha fill extended to the radiographic apex with no evidence of periapical radiolucency or external resorption was seen (fig no.2).

After discussing treatment options—including no intervention, placement of a porcelain veneer, or internal bleaching—the patient opted for conservative bleaching. Written informed consent was obtained in accordance with institutional ethics guidance.

First Visit

Under rubber-dam isolation, the existing composite access filling was removed and 2 mm of gutta-percha was withdrawn apical to the cementoenamel junction and condensed using a heated plugger. A 2 mm thick glass-ionomer cement barrier was placed over the remaining obturating material to prevent apical penetration of peroxide (fig no.3). A freshly mixed paste of sodium perborate and 6 % hydrogen peroxide (1 g : 0.5 mL) was compacted into the pulp chamber until slightly beyond the labial access outline . The cavity was sealed with a provisional zinc-oxide-eugenol-free temporary material. The patient was instructed to avoid chromogenic foods and recalled after five days.

Second Visit

On re-examination the discoloration had lightened but remained discernible. The provisional seal and bleaching paste were removed, the chamber irrigated with distilled water and dried, and a freshly prepared of sodium-perborate/peroxide paste was placed (fig no.4). An LED bleaching system emitting blue wavelength light (430–490 nm) was held 5 mm from the labial surface for 60-second cycles over five minutes to accelerate oxygen radical liberation (fig no.6). The access was resealed with the intermediate restorative material, and the patient was recalled after another five days.

Third Visit

At the third appointment the shade of tooth 21 matched the adjacent central incisor (A2) under natural daylight (fig no.7). The bleaching paste was flushed out and the chamber irrigated with 5 % sodium thiosulfate followed by saline to neutralize residual peroxide, then dried. To allow dissipation of oxygen and minimize interference with resin adhesion, the access was left unrestored for 24 hours. The following day, enamel margins were etched with 37 % phosphoric acid, rinsed, dried, and a universal adhesive applied. The chamber and access cavity were incrementally restored with nanohybrid composite (Tetric N-Ceram, shade A2) and finished to harmonize surface texture and translucency.

Follow-up

One week later the restoration was intact, gingival tissues healthy, and the shade unchanged. The patient reported heightened confidence and no sensitivity. A six-month review appointment was scheduled to monitor color stability and potential cervical resorption.

FIGURE NO.1- PRE-OPERATIVE PHOTOGRAPH (FIRST VISIT)

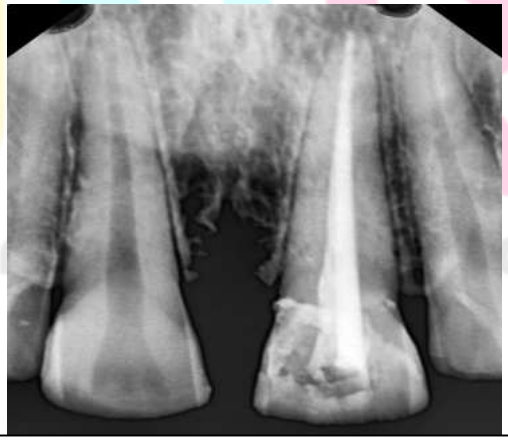

FIGURE NO.2 - PRE-OPERATIVE RADIOGRAPH

FIGURE NO.3 -GP REMOVED USING PEESO REAMER AND BARRIER MADE USING GIC

FIGURE NO.4 - MIXTURE OF SODIUM PERBORATE AND HYDROGEN PEROXIDE IS PLACED IN THE PULP CHAMBER

FIGURE NO.5 - SECOND VISIT APPOINTMENT

FIGURE NO.6 - LED BLEACHING SYSTEM PROJECTED AT THE TOOTH AT THE SECOND VISIT

FIGURE NO.7 -THIRD VISIT PHOTOGRAPH

Discussion

Thermocatalytic intracoronal bleaching is a reliable technique for managing discoloration in non-vital teeth, particularly in the aesthetic zone where cosmetic demands are high.[1] The procedure involves placing an oxidizing agent—usually hydrogen peroxide or a peroxide-sodium perborate mix—inside the pulp chamber of an endodontically treated tooth. Success, however, depends on adherence to key biological and procedural guidelines to prevent complications and achieve optimal results.[4] Activation with heat or light enhances its bleaching action.[7]

Three main biological principles govern the success of this approach. First, a proper apical and cervical seal is essential to prevent peroxide leakage toward periodontal tissues, which could lead to external cervical resorption.[9] In this case, a well-condensed root canal filling and a glass ionomer barrier at the CEJ ensured protection against leakage.

Secondly, an appropriate bleaching agent is essential for a successful outcome. The ideal agent must be strong enough to break intrinsic stains (from trauma, necrotic tissue, or medicament staining) yet gentle enough to avoid dentin damage.[10] A 6% hydrogen peroxide and sodium perborate mixture was chosen here for its effective whitening action and lower risk compared to higher peroxide concentrations.[12] Sodium perborate also provides a buffering effect, maintaining pH and minimizing dentinal or periodontal harm.[1]

Third, careful follow-up is needed to monitor for complications like external cervical resorption. While heat can enhance peroxide action, it also increases resorptive risk.[13] Instead of high heat, an LED light system was used here, which accelerates peroxide breakdown safely by generating reactive oxygen species while limiting thermal damage.[7,15]

Advantages of the technique include its conservative and cost-effective nature compared to invasive procedures like veneers, which involve irreversible tooth reduction and higher costs.[11] Intracoronal bleaching is localized within the pulp chamber, reducing tissue exposure and post-treatment sensitivity, unlike external bleaching of vital teeth.[10] Precautions such as strict isolation and complete removal of bleaching agents before restoration are crucial since residual peroxide can impair composite resin bonding.[14] In this case, the patient was kept under observation for subsequent review for any postoperative sensitivity, secondary discoloration, or resorption, indicating the procedure's safety and effectiveness.

Conclusion

The thermocatalytic bleaching employed sodium perborate and 6% hydrogen peroxide, supplemented by LED activation, provided swift, conservative, and aesthetically satisfying rehabilitation of a discolored non-vital maxillary central incisor in a 22-year-old patient.[11] The procedure preserved all surrounding tooth structure, avoiding the biological and financial costs of indirect restorations, and achieved a shade match that remained stable at early recall. Regular follow-up visits will continue to ensure long-term color stability and periodontal health, reinforcing intracoronal bleaching as a first-line aesthetic solution for suitably treated non-vital anterior teeth.

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